Emergency and Supplemental Forages

Department of Agronomy

Despite the best plans, shortages of forage commonly occur some time during the year in Kansas. Drought, hail, early freezes, crop failure, harvest delays and unusually cold and wet winters can cause forage shortages.

In response, producers may choose to buy the extra forage needed or sell off some cattle. But in many cases, it may be more economical to bridge the gap by:

- Planting a small grain cereal, summer annual grass, or nontraditional forage; or
- Utilizing crop residue or weather-damaged crops.

The best options for supplying emergency forage depend on what is available locally and at what time of year the shortage occurs (Table 1).

Table 1. Emergency Forage Utilization Possibilities.

Time of year shortage occurs	What can be done to supply forage quickly
Winter	Use pasture from fall-planted small grain cereals Graze corn/sorghum stubble Use ammoniated corn or sorghum stover Use silage or hay from summer annuals
Spring	Plant spring oats for pasture or hay Use pasture, silage or hay from fall-planted small grain cereals
Summer	Graze wheat stubble Use ammoniated wheat straw Plant sudangrass, sorghum-sudan, or silage or hay Graze or harvest the weather-damaged crops Graze or hay soybeans Use kochia, and other nontraditional forages
Fall	Graze corn/sorghum stubble Ammoniate corn or sorghum stover Graze or harvest the weather-damaged crops Plant barley, wheat, rye or triticale for pasture and spring supply of silage or hay

Small Grain Cereals

When an unexpected shortage of forage occurs, small grain cereals, summer annual grasses, and certain nontraditional forages can provide pasture, hay or silage within a reasonably short time (Table 2).

Winter wheat, winter barley, triticale, rye and spring oats are the small grain cereals best adapted for forage production in Kansas. For more detailed information, see KSU Extension publication MF-1072, *Small Grain Cereals for Forage*.

Pasture. Small grain cereals intended for emergency fall pasture should be planted as early as feasible. Where soil moisture is adequate, late August to early September seedings usually result in optimum pasture production in all areas of Kansas. Under good conditions, the plants will be well-rooted, tillered and ready for grazing within 30–40 days.

Pasture production declines with later planting dates. By mid-October in northwestern Kansas to late-October in southeastern Kansas, it is too late most years to plant small grains for fall and winter pasture. If pasture is absolutely needed in late fall beyond the range of optimal planting dates, producers have the best chance for success by planting rye.

Under good growing conditions, a well-fertilized small grain pasture can carry about 500 pounds of cattle per acre. Under poor growing conditions,

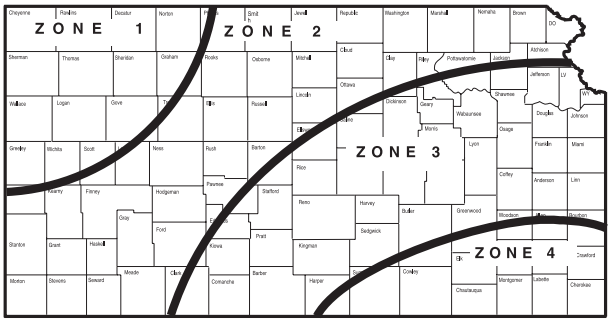

Table 2. Quick Pasture From Supplemental Forages.

Crop	Suggested planting dates for pasture zone 1	zone 2	zone 3	zone 4	Average days from seeding to grazing
Small grain cereals:					
Wheat	8/25–9/10	9/1–10/5	9/1–10/10	9/5–10/10	30–40
Barley	8/25–9/10	9/1–9/20	9/10–10/15	9/10–10/5	30–40
Rye	8/20–9/10	8/25–9/20	9/1–9/25	9/1–10/1	30–40
Triticale	8/20–9/10	8/20–9/20	9/1–9/25	9/1–10/1	30–40
Spring oats	3/5–3/30	3/1–3/25	3/1–3/20	2/20–3/15	30–50
Summer annual grasses:					
Pearl millet	6/1–7/10	6/1–7/10	6/1–7/10	6/1–7/10	30–40
Foxtail millet	6/1–7/10	6/1–7/10	*	*	20–30
Sudangrass	5/15–7/10	5/20–7/10	5/20–7/10	5/20–7/10	30–50
Sorghum–sudan	5/15–6/15	5/20–7/1	5/20–7/5	5/15–7/1	30–50
Forage sorghums	*	*	*	*	*

* Not recommended for pasture in this area.

stocking rates should be reduced considerably. Cattle gains of 1.5–2.5 pounds per day are possible during periods of good pasture production.

In general, small grain cereals produce good pasture in late fall and early winter. Production declines during the winter and generally resumes in late February, depending on temperature, moisture conditions and fertilization. Winter barley has the best forage yield potential in fall and early winter. When planting a small grain cereal for pasture in late February to early March, spring oats is the only choice.

Hay. Hay yields of small grain cereals often average 2–4 tons per acre (air dry basis). The quality of small grain hay depends primarily on the stage of maturity of the crop when harvested, and how it was handled and protected after harvest. Small grain hay can be similar to bromegrass hay in nutritional value.

Small grain cereals can be harvested for hay any time up to the milk stage of grain development. This is the best compromise between the highest dry matter yield and maximum hay quality. Later cutting will yield more, but digestibility and protein levels will decline and, on many varieties, awns (beards) will be more fully developed. Forage quality is highest at the boot stage. The quality and palatability of rye hay, in particular, declines rapidly in the spring.

For an early spring planting, spring oats is a much better option in Kansas than spring wheat, spring barley, or any of the fall-seeded small grain cereals. Oat hay has very good quality when harvested in the early boot stage. Spring oats usually will be ready to harvest for hay about 60 days after planting.

Rough awns (beards) in small grain hay will cause irritation for cattle. Considerable soreness and irritation to the eyes, mouth, lips, gums and lower surface of the tongue can occur. To minimize this occurrence, a crop with rough awns should be ensiled or grazed rather than baled for hay. If hay-making is the only practical option, harvest awned varieties while they are immature or tub-grind the hay.

Silage. Small grains, especially winter barley, can provide silage nearly equivalent in feed value to corn silage. Small grain cereals normally produce about 5–7 tons per acre of 35 percent dry matter silage when cut at the late-boot stage and 8–10 tons when cut in the late-dough stage.

For silage purposes, small grains should be cut at the mid- to late-dough stages, or earlier. Ensiling small grain cereals properly can be difficult because of their hollow stems. To optimize ensiling conditions, chop finely at 60–70 percent moisture, pack thoroughly, and cover the forage with plastic.

Summer Annual Grasses

Sudangrass, sorghum-sudangrass hybrids, forage sorghum and hybrid pearl millet are potentially high-yielding sources of high-quality pasture, hay or silage. Foxtail (German) millet is another possibility, especially in western Kansas. Foxtail millet has reduced quality and palatability with advancing maturity, and forage yields are relatively poor, but it can be planted later than other summer annual grasses in an emergency and provide quick cover.

Sudangrass and hybrid pearl millet will provide the quickest source of forage in early summer, either as pasture or hay. In an emergency, sudangrass can be planted earlier than the millets. In general, summer annual grasses should be planted when soil

temperatures reach 70–75°F at the planting depth, usually sometime in May. Hybrid pearl millet and foxtail millet are especially intolerant of cold, wet soils and should not be planted until late May or early June.

Sorghum-sudangrass hybrids produce higher forage yields than sudangrass or the millets, but more than 50 percent of their production is stem. Therefore, sorghum-sudangrass is better suited for late-summer silage or green chop than early summer grazing. High-yielding forage sorghums mature late in the growing season and are best suited for one-cut silage operations.

For complete details on these crops, see KSU Extension publication MF-1036, *Summer Annual Forages*.

All summer annual grasses can cause livestock poisoning due to nitrate toxicity. Nitrate toxicity occurs when the plants are stressed by drought, shade, frost or temperature extremes. Analysis is necessary to determine if the feed is potentially toxic. Prussic acid, or hydrogen cyanide poisoning, occurs only in sorghums and sudangrasses, not pearl millet or foxtail millet. It occurs most often when cattle graze new shoot growth at the end of a summer drought or after the first fall freeze. For complete details, see KSU Extension publication MF-1018, *Nitrate and Prussic Acid Toxicity in Forage*.

Pasture. Sudangrass and hybrid pearl millets can provide high-quality pasture within about 4–6 weeks of seeding. Foxtail millet is less productive than other supplemental forages, but can provide a small amount of pasture within about 3–4 weeks. Sorghum-sudangrass hybrids can be grazed, but are less palatable than sudangrass and the millets. Forage sorghums are a poor choice for grazing.

With a rotational grazing system in which each subdivided section of a pasture is grazed to a 6- to 8-inch stubble every 10–14 days, sudangrass and hybrid pearl millet can provide nearly 90 days of high-quality forage. During this time, each acre can supply forage for about 1,000–3,000 pounds of cattle.

Hay. Sudangrass and hybrid pearl millet are the best adapted summer annual grasses for multiple hay cuttings. Foxtail millet can provide hay a little later in the season than the other summer annuals if needed, but it is less productive. Sorghum-sudangrass hybrids can be cut for hay, but their thick stems are difficult to cure. For high-quality hay, plants should be cut before the heads emerge. Mouth irritation and lump-jaw can develop in cattle fed millet hay cut after heading.

When planted as soon as soil temperatures reach 70–75°F at the planting depth, sudangrass and pearl millet can produce two good hay crops, or even three in higher rainfall areas. Be sure to leave 6–8 inches of stubble for regrowth. Sudangrass has greater regrowth potential than pearl millet. Sudangrass and pearl millet can also produce a hay crop when planted as late as mid-July, provided adequate moisture and nutrients are available. Foxtail millet normally produces only one hay crop.

Silage. Sorghum-sudangrass hybrids and forage sorghums can provide high silage yields late in the growing season. Highest quality silage is from forages having at least 20 percent of their dry matter as grain. Grain sorghum also makes good silage. Harvest should be delayed until the hard dough stage because high-moisture silage has poor quality and low palatability. For more detailed information, see KSU Extension publication AF-144, *Producing Sorghum Silage*.

Nontraditional Forages

In an emergency, it's possible to use a number of crops and weeds as nontraditional forage. Among the possibilities that have proven useful in Kansas are:

Soybeans. Although no longer used as a forage, soybeans once were routinely grazed and hayed. Cattle do quite well on grazed soybeans, although bloat can occur. Pasturing can begin as soon as the plants are 12–18 inches tall. If the cattle are removed once most of the leaves have been eaten, there can be enough regrowth for the crop to be grazed again in about a month. Soybean hay is a satisfactory substitute for alfalfa or clover hay in feeding beef or dairy cattle if it is put up before pods are an inch long. A mixture of chopped soybeans with corn or sorghum forage at the rate of 1 ton of soybeans with 2–4 tons of corn forage produces good silage.

Kochia. This hardy weed can be used in central and western Kansas as an emergency forage crop for calves, yearling cattle and cows. It does not grow well in the eastern third of the state. Kochia can be cut and baled or ensiled for winter feed, or grazed. It is a low-fiber, high-protein forage, with protein levels comparable to those of alfalfa during the early stages of its growth. Kochia should not comprise a major portion of the diet for cattle, even under extreme circumstances. Weight loss and toxicity symptoms, such as photosensitization, occasionally have been reported in cattle grazing older, mature stands of kochia. Nitrate and oxalate toxicity is also possible with kochia. Steers that graze kochia gain less than those grazing native grass pastures, but they perform well once moved to a feedlot. Caution is advised in the management of livestock grazing kochia pastures. Remember, kochia is a weed, and seed in the hay can be spread to crop fields.

Amaranth. Although normally considered an alternative grain crop, amaranth (red pigweed) can be cut for

hay or silage. Some studies suggest that amaranth might be superior to soybean and oat forage, but inferior to sudangrass or sorghum-sudangrass hybrids in forage yield and crude protein. Amaranth forage feeding studies indicate good performance by ruminants. Poor performance by nonruminants has been reported. As a forage, amaranth can produce nitrate and oxalate toxicity. High nitrate and/or oxalate levels appear to be most common in mature and drought-stressed amaranth, and the risk of toxicity is higher when amaranth is the sole source of feed.

Brassicas (kale, rape, turnips). Forage brassicas are high-quality, fast-growing cool-season crops that can offer good grazing potential throughout the entire state. Both tops and roots can be consumed. The brassicas can be seeded from mid-March through May for summer grazing, or in June to August for fall/winter grazing. Brassica forage has exceptionally high digestibility, crude protein levels and energy content. Fiber content is low, however, so roughage must be provided to cattle grazing on brassicas. Nitrate toxicity is also possible where excessive nitrogen has been applied.

Certain rape varieties have produced large quantities of palatable high-protein forage for sheep in northwestern Kansas. It can be planted in March and ready for grazing within 60 days if a good stand has been established. Forage rape can also be planted in late summer for fall and winter grazing. Turnips can provide good grazing throughout the state if there is good root development. The bulblike root is also eaten by cattle after the leaves and stems have been grazed off. Turnips can be seeded in April for mid-summer grazing, or in August for fall and winter grazing. Grazing usually begins about 45–60 days after seeding.

When planted immediately after wheat harvest on irrigated ground and provided some water for emergence, brassicas can make an excellent forage to carry livestock through the summer into the early small grain pasture season.

Crabgrass. Crabgrass can make an excellent forage for grazing. The palatability of immature crabgrass is as high as native grasses. Cattle should be removed or rotated to another pasture when the crabgrass is grazed down to about 3 inches. Regrowth will then occur after a rain. Crabgrass is also an excellent source of hay. It should be cut prior to maturity. Remember, crabgrass is a weed and seed will be spread in the hay.

Johnsongrass. Johnsongrass, a noxious weed in Kansas, has significant forage potential as a hay crop in an emergency. It must be harvested in the boot stage for highest quality. Johnsongrass can also serve as a source of grazing forage. It is palatable to cattle, and the animals will selectively graze it. Prussic acid poisoning is a concern when grazing Johnsongrass that is drought-stressed or experiencing regrowth in the fall after a frost. Prussic acid is not a problem in well-cured Johnsongrass hay or silage. Because Johnsongrass is a noxious weed, it should not be allowed to produce seed.

Cattails. Cattails normally grow in wet areas that are inaccessible to cattle. During periods of extreme drought, however, it may be possible to gain access to cattails for grazing or hay. Little information is available on the forage quality of cattails, but there have been reports in Kansas of using cattails for emergency hay or grazing with no apparent drawbacks.

Other Weeds. Some weeds and weedy grasses are palatable, but others are unpalatable or are associated with toxicity. Among the weeds and grasses that have been found to have acceptable palatability to sheep are yellow foxtail, barnyardgrass, green foxtail, redroot pigweed, Pennsylvania smartweed and common lambsquarters. Unapalatable species are giant foxtail, wild mustard, giant ragweed and common cocklebur. Common ragweed and velvetleaf are somewhere in between. Palatability is not related to nutritive value. Redroot pigweed, common lambsquarters and common ragweed have nutrient composition and digestibility similar to that of average-quality alfalfa. There have been reports of nitrate toxicity in redroot pigweed, common lambsquarters, barnyard grass and Pennsylvania smartweed. Wild mustard seed, which contains toxic glycoside, has been reported to be poisonous to cattle and cause gastrointestinal distress. Young cocklebur seedling have been reported to be poisonous to cattle, sheep, and hogs.

Using Weather-Damaged Crops

Drought, hail and freeze damage can affect forage and grain crops in Kansas. In many cases, these weather-damaged crops can be used as forage. Feed value is often affected less by weather damage than yield. The most important thing to do before feeding any weather-damaged crop is to have it tested. Forage testing can provide two valuable types of information: the nutritional value—especially crude protein, acid detergent fiber (ADF) as an indication of energy, and moisture content; and the presence of any potential toxins, especially nitrate and prussic acid (Table 3). For more information on nitrate and prussic acid toxicity, see KSU Extension publication MF-1018, *Nitrate and Prussic Acid Toxicity in Forages.*

Table 3. Relative Toxicity Risk of Harvesting Stressed Forages.*

Harvest method	Prussic acid**	Nitrates
Grazing	High	Moderate
Green chop	Moderate	High
Hay	Low	High
Silage	Low	Low

* From KSU Extension Animal Sciences handouts

** Only a concern with sudangrass, sorghum-sudans, forage sorghums and Johnsongrass

Don't underestimate the feed value of drought- or frost-damaged forages. Typically, grasses compensate for reduced yield by increasing their nutritional content. On the other hand, grain-producing forages are usually lower in feed value when weather-stressed, depending on grain stage.

Some special considerations for making silage from sorghum and corn stressed by drought or frost are listed in Table 4. Grain sorghum, in particular, often suffers from poor weather in late summer and fall. Weathered- and sprout-damaged grain sorghum can be used, with the following points taken into account:

Table 4. Making Silage from Drought- and Frost-Stricken Sorghum and Corn.

1. Feed value is normally 75–95 percent of normal silage when properly ensiled.
   - There will be more carbohydrate in the stalk than normal, which compensates for loss of grain content.
   - The feeding value varies, depending on the severity and timing of stress.
2. Proper ensiling moisture content is extremely important.
   - Plants usually look drier than they really are due to wet stalks.
   - Ensiling when too wet results in excessive fermentation and seepage.
   - Ensiling when too dry causes poor fermentation and heating.
   - Allow the forage to dry down to 65–70 percent moisture, if possible.
   - The weather-stressed forage can be mixed with drier chopped feeds to reduce moisture content.
3. Crude protein content is usually higher than normal.
   - Drought-stressed forages will have about 10–11 percent crude protein, compared with 7–8 percent in a nonstressed condition.
   - Soluble protein is 2–3 times higher in the stalk than normal silage.
   - Supplement the silage with natural protein supplements.
4. Test for nitrate content before feeding. There is typically a 40–50 percent loss during fermentation.

- There is a major loss in yield, but not in feed value.
- There will be higher field, harvesting, and handling losses.
- Mycotoxin problems are rare while in the field.
- The grain is stable in storage when dried properly.
- There is usually little change in nutrient content. Digestibility of protein and starch increases. The grain is softer and dustier.
- The feed value for cattle is at least 95 percent of normal. The grain will be dirtier, and must be processed finely. Palatability may be reduced due to dust. It should be blended with other grains or forage if possible.

Weather-induced problems often result in light test-weight grain sorghum, but this may not lower its feed value. The feed value of 40–60 pound test grain sorghum is similar. When test weights are below 40 pounds per bushel, however, starch content decreases and fiber level increases. Light-weight grain sorghum generally has smaller seed size, greater variation in seed size and more trash than normal. Fine processing is critical with small sorghum berries.

Weather-damaged feeds can be successfully used for feeding cattle. The key is to have the feed tested for nutritional content and potential toxins.

Using Crop Residues

One of the most cost-effective ways of providing forage is to use existing crop residues. Wheat, corn and grain sorghum stubble can be grazed. The stover of these crops can also be ammoniated for improved feed value. Before using crop residues on highly erodible land, check the regulations regarding conservation compliance.

Grazing Wheat, Corn and Grain Sorghum Stubble

Crop stubble can provide up to 100 days of grazing for cows and steers, depending on the amount of residue, stocking rate and weather conditions. Wheat stubble has limited feed value because of its low energy and protein content. But nonlactating, spring-calving beef cows can be maintained on diets comprised primarily of corn and grain sorghum residues from weaning until mid- to late-pregnancy with a minimum of protein supplementation. Supplementation with protein and possibly energy may be necessary later in the season as the cows' nutritional requirements increase 50–60 days before calving.

The greatest feed value from grazing stubble comes shortly after harvest. During that period, cattle use about 25–35 percent of the available residue from leaves, husks and lost grain.

Table 5. Nutritional Value of Crop Stubble.*

			Carrying capacity (AUM/Acre)**		
			Crop Production		
Type of stubble	Crude protein	Digestibility	Low	Medium	High
Corn	4–7%	35–55%	1.0	1.5	2.0
Grain Sorghum	5–7%	35–50%	0.8	1.3	1.8
Wheat	3–5%	30–40%	0.6	1.0	1.5

* From P.D. Ohlenbusch, 1992. "Kansas Grazingland Management" workbook.

** AUM/Acre (Animal Unit Month per Acre) is the amount of forage required to sustain for 30 days one 1,000-pound mature cow of average milking ability with a calf less than 3–4 months postpartum. One AUM works out to be 750 pounds of air dry forage.

The carrying capacity of crop residues depends on the amount and type of grain and residue left in the field, method of pasturing and weather conditions (Table 5). The most efficient way to graze stubble is by using more cattle for shorter periods of time. By pasturing intensively, there will be less selective grazing, and cattle will consume more low-quality material.

Prussic acid toxicity is a concern when grazing grain sorghum stubble if regrowth is occurring. The new growth should be tested. Otherwise, after harvest or a light frost, wait until 18–24 inches of growth has occurred before grazing. After a killing freeze, wait 7–10 days before initiating grazing.

Ammoniated Wheat Straw, and Corn and Grain Sorghum Stover

A good source of emergency feed is ammoniated wheat straw, and corn and grain sorghum stover. Only low-quality forages, such as crop residues and mature grass hay, should be ammoniated. Hay from bromegrass, fescue, small grains, forage sorghums or sudans should not be ammoniated as this can create toxicity potential.

Table 6. Ammonia Increases Protein, Digestibility and Intake.*

Residue	% Crude Protein		% Digestibility		Increased Intake
	Control	Treated	Control	Treated	
Wheat straw	3.7	9.7	38.9	48.0	18%
Corn stover	6.2	11.0	48.0	56.2	22%
Sorghum stover	5.4	16.8	46.2	61.3	20%

* From KSU Extension Animal Sciences handouts

Ammonia treatments can dramatically increase the feed value of crop residues (Table 6). Application of 3 percent anhydrous ammonia to wheat straw, for example, will more than double its crude protein content and increase intake and digestibility.

Generally, ammoniating low-quality forages increases total digestibile nutrients (TDN) by 10–15 percentage units, which increases the available energy content. Ammoniation also increases crude protein levels. Ammoniated residues are readily consumed if the material is allowed to air out for 3–5 days before feeding. Gain is greater for cattle eating ammoniated versus nonammoniated residue.

Summary

■ Various alternatives exist for obtaining an emergency source of forage. It may not be necessary to buy additional forage or reduce cattle numbers.

■ Small grains, summer annual grasses, nontraditional forages, weather-damaged crops and crop residues can provide emergency forage on short notice nearly any time of the year.

■ Emergency forages should be tested for nutritional content and toxicity potential before feeding. Forage testing is a useful and economical management tool, even in normal years.

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